

# PROJECT facts

U.S. DEPARTMENT OF ENERGY  
NATIONAL ENERGY TECHNOLOGY LABORATORY

Natural Gas  
Infrastructure Reliability

09/2002

## CONTACT POINTS

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## PRIMARY PROJECT PARTNER

**New York Gas Group**  
New York, NY

## PROJECT DURATION

12 Months

## COST SHARING

DOE	\$494,958
Non-DOE	\$672,379

## STRATEGIC CENTER FOR NATURAL GAS WEBSITE

[www.netl.doe.gov/scng](http://www.netl.doe.gov/scng)

## DESIGN, CONSTRUCTION, AND FIELD DEMONSTRATION OF EXPLORER, A LONG RANGE UNTETHERED LIVE GASLINE INSPECTION ROBOT SYSTEM

### Description

This project will develop an untethered robot prototype for inspection of gas distribution mains. Distribution mains are currently inspected using tethered systems that have limited range (about 500 ft from the launch point) and inspection views. In addition, the functions of today's systems cannot be expanded.

The New York Gas Group will construct and demonstrate EXPLORER, a prototype pipe inspection tool for use on active gas distribution mains (150 to 200 mm, or 6 to 8 in.). The prototype will be composed of modules that store power, promote wireless communication, and transport a state-of-the-art camera that transmits video from inside pipes to an above-ground television. The modular construction accommodates various components for different tasks, such as inspection, repair, and sample retrieval. The prototype system will include all the basic modules needed by the system: locomotion, power storage, wireless communication, and camera.

The purpose of EXPLORER is to be able to access live gas mains, insert the system in the piping network, and remotely drive it within the gas main and its laterals for distances of 5,000 to 10,000 ft. The adaptable locomotion system will allow the robot to function through varying diameter pipes, and will be powered by on-board battery banks. Solid-state fisheye-type cameras in both ends of the robot will transmit real-time forward and circumferential views of the pipeline internals, which the operator will view live on an aboveground television. Communication will take place through a wireless link between the robot and the launch chamber used to insert and retrieve the robot. This link is based on commercial technology presently used in wireless telecommunication networks.



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## CUSTOMER SERVICE

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Communication over long distances as well as battery recharging will be accomplished, without retrieving the robot, through the use of auxiliaries. These auxiliaries, to be developed in a follow-on phase to the project, will allow insertion of additional antennas and battery recharge plugs into the pipe under live conditions through inexpensive keyhole-size excavations.

The project is a joint effort among the New York Gas Group (NYGAS, a trade association of the publicly owned gas utilities in New York State), the Jet Propulsion Laboratory, and Carnegie Mellon University's National Robotics Engineering Consortium.

## Goal

The goal of this project is to help modernize the nation's natural gas delivery system. It responds to the Secretary of Energy's message of May 2001: "By 2020, Americans will be consuming 50 percent more natural gas than today. We will need newer, cleaner, and safer pipes to move these larger quantities of natural gas." The project responds to the Natural Gas Infrastructure Reliability Program goal: to foster the technologies needed to ensure the integrity, operational reliability, and efficiency of the nation's natural gas infrastructure as it adapts to rapidly changing natural gas markets.

